MooringSense – GA 851703

Mooring System Integrity Management through Monitoring, Digital Twin and Control Technologies for Cost Reduction and Increased Efficiency

D1.4 Version 1.0

Data Management Plan Year 1

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Executive Summary

The purpose of the D1.4 Data Management Plan Year 1 is to provide an overview of all datasets collected and generated within the MooringSense project, and to define the consortium's data management policy that will be implemented. This initial version of the Data Management Plan defines the general policy and approach to data management in MooringSense. It covers management issues related to both administrative and technical aspects (e.g. collection of data and metadata, publication and deposition of open data, repository compliance with the Open Access Infrastructure for Research in Europe- OpenAIRE).

The MooringSense Data Management Plan follows the Horizon 2020 FAIR Data Management Plan (DMP) Template. It is intended to be a living document in which information will be made available on a finer level of granularity through updates as the implementation of the project progresses and when significant changes occur. In this regard, it summarises the intermediate results of the data collection activities that are being carried out

Next versions of the Data Management Plan will refine and enhance policy aspects and will go into more detail regarding the datasets collected and produced by the MooringSense project.

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List of Acronyms and Abbreviations

Term	Description
ASCII	American Standard Code for Information Interchange
API	Application Programming Interface
CC-BY-SA	Creative Commons Attribution-ShareAlike
CLK	Clock product
CLK_30	Clock product 30 seconds
CLS	Collecte Localisation Satellites
DOI	Digital Object Identifier
EC	European Commission
EPH	Ephemeris
ERP	Earth Orientation Parameters
FAIR	Findable, Accessible, Interoperable and Reusable
FOW	Floating Offshore Wind
FOWT	Floating Offshore Wind Turbine
GNSS	Global Navigation Satellite System
HTTP	Hypertext Transfer Protocol
IGS	International GNSS Service
IPR	Intellectual Property Rights
NTRIP	Networked Transport of RTCM via Internet Protocol
PPP	Precise Point Positioning
PR	Pseudo-range
RINEX	Receiver Independent Exchange
RTCM	Radio Technical Commission for Maritime Services
SHM	Structural Health Monitoring
SP3	Satellite orbits and clocks 15 minutes
SUM	Summary of orbital product
WGS84	World Geodetic System 1984
WP	Work Package

1. Introduction

1.1 Purpose and scope

The MooringSense project is part of the Open Research Data Pilot launched by the European Commission along with the H2020 programme. It is a requirement for participants to elaborate and submit a Data Management Plan that will be reviewed and updated throughout the project duration.

The aim of this deliverable is to describe the MooringSense Data Management Plan, whose main purpose is to identify and explain the main elements of the data management policy that will be used by the Consortium with regard to the project research data. This policy has been defined according to the FAIR data principles, as defined by the European Commission in H2020, the Grant Agreement and the Consortium Agreement. Consequently, the Data Management Plan covers several aspects such as the different kinds of research data that will be generated, collected or processed during the project, the standards and methodologies that will be used, how the research data will be preserved and whether the data will be made open access for verification or reuse.

The Data Management Plan presented in this deliverable is the first version of the plan, while two updates will be provided in month 24 and month 36.

1.2 Intended audience / Classification

This document is intended for all project partners, WP leaders and WP participants. The document is not intended for use outside the project, it is therefore classified as a restricted document.

1.3 Application documents

Inputs from the following documents were used as a source of information for preparing this document:

Table 1.1: Application documents

REF	Document
AD-01	Grant Agreement-851703 - MooringSense
AD-02	Consortium Agreement - MooringSense

1.4 Document structure

The document is structured in the following sections:

- Section 2 briefly describes the kinds of data that will be produced within the MooringSense project and the general approach that will be adopted towards Open Research Data. Besides, this section describes the technically the main datasets that will be generated in every WP.
- Section 3 provides the description of the data management policy of MooringSense project, which is aimed at making research data findable, accessible, interoperable and re-usable
- Section 4 reviews the allocated resources for the data management, including resources for the long-term preservation of the datasets, as well as, the main responsibilities from MooringSense partners.

- Section 5 describes the provisions that are in place from the point of view of data security.
- Section 6 covers the ethical aspects related to MooringSense project.
- Section 7 identifies other procedures used for data management, like the ones derived from European or National legislations.

2. Data summary

The MooringSense project development will require the collection, processing, generation and storage of several diverse datasets related to the different research fields involved in the project. These datasets will be related to the degradation and performance of materials, components (i.e. mooring lines) and systems, as well as, the performance of individual Floating Offshore Wind Turbines and farms, including motions, loads, and aspects related to control and energy production. The following table summarizes the different kinds of data that will be generated in MooringSense.

Table 2.1: Types of data generated in MooringSense

WP	Types of data
WP3	FOWT model and performance (tests and simulations)
WP4	Smart Motion Sensor measurements
WP5	SHM data (inputs and outputs)
WP6	Control algorithms performance in simulations
WP7	Costs

Datasets can be the direct result of a collection of measurements during a testing campaign (unprocessed data), as well as, curated data, or post-processed data obtained after carrying out any analysis/processing technique. Datasets can also consist in synthetic data obtained through simulations.

On the other hand, some of the datasets that will be produced within the MooringSense project may be associated to scientific publications, other datasets can be part of a public project reports and other data might not be directly attributable to a publication. At this regard, the policy for open access is summarised in the following picture.

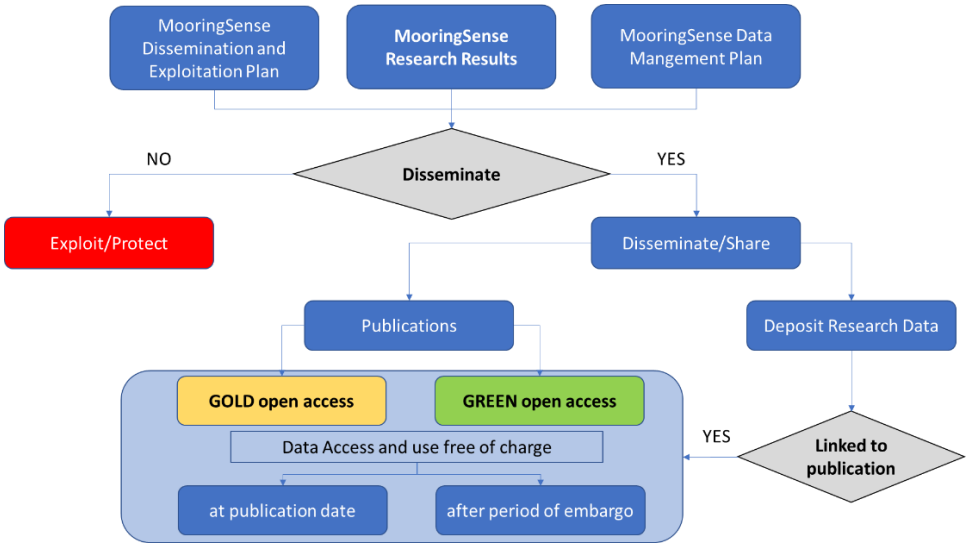

Figure 2.1: Research data deposit and timing

Research **data linked to exploitable results** will not be made public if its publication might jeopardize the future commercialization of project results, which is a H2020 obligation. The rest of research data will be deposited in an open access repository.

The **data linked to scientific publications** (including associated bibliographic metadata), needed to validate the presented results, will be deposited in an open research data repository. Research data and scientific publication deposit will be made at the same time. For “Gold” Open Access publications, the underlying data will be openly accessible at the publication date, while for “Green” Open Access it will be after the period of embargo (i.e. 6 months after publication). Underlying research data will be considered as a crucial part of the publication and it may consist of selected parts of the general datasets generated, and for which the decision of making that part public has been made.

Other kinds of open datasets generated within the MooringSense project are the ones related to any public report, or data that is considered useful for the research community. They may be selected parts of the general datasets, or full datasets. In these cases, datasets will be published as soon as they become available.

Finally, as many of the activities to be developed within the MooringSense project have not even started this first version of the Data Management Plan does not provide a comprehensive list of datasets with very detailed information. Nevertheless, the information provided within this section gives a good overview of the different types of datasets that are required for the project development. Besides, the overall methodology to follow is presented, including the associated templates and models: Appendix A – Dataset Information Template and Appendix B - Metadata model .

2.1 Data in WP3

2.1.1 Datasets in WP3

Videos of model tests	
1. Responsible party 1.1. Role of partners 1.2. Responsible party 1.3. Responsible person	○ Responsible party role Sintef Ocean is responsible for collecting the data and CTC is responsible for storing the data. ○ Responsible party Sintef Ocean ○ Responsible person Nuno Fonseca
2. Data Provenance 2.1. Description 2.2. External datasets 2.3. Internal datasets 2.4. Tools	○ Description In WP3 a FOWT model will be tested in Sintef Ocean's Ocean Basin Laboratory. The dataset will consist in the Video Recording carried out for the interpretation of results. Tests will include both the baseline condition and a preselected set of degraded conditions. Some of the degraded conditions can consist in mooring line failures, anchor dragging, (un)expected degradation of synthetic ropes, etc. The test matrix will include the following groups of tests (To be confirmed): (a) Environmental calibration of waves and current. (b) System identification tests: (c) Tests in periodic waves (d) Tests in irregular waves and intact mooring system (e) Tests in irregular waves and fault scenarios (f) Tests in irregular waves and control strategies for reduced mooring line loads: ○ External datasets Not applicable ○ Internal datasets Not applicable ○ Model/Tool Not applicable
3. Intended use 3.1. Description 3.2. Related enablers/components 3.3. Interrelations	○ Description This data set will be used within Task 3.3 (High fidelity numerical coupled model of the FOWT) as part of the calibration and validation processes. The videos will be used to help in the interpretation of complex physical phenomena and in this way contribute to the calibration of numerical models. ○ Related enablers/components High fidelity numerical coupled model of the FOWT. ○ Interrelations The dataset is an input for the development of the high fidelity numerical coupled model of the FOWT.

4. Data description 4.1. Dataset information 4.2. Parameter information 4.3. Storage 4.4. Metadata	○ Dataset information To be defined ○ Parameter information Not applicable ○ Storage To be defined ○ Metadata To be defined
5. Data management 5.1. Availability 5.2. Owner 5.3. Open Access 5.4. Access conditions	○ Availability The data will be produced in the MooringSense project ○ Owner Sintef Ocean ○ Open Access Yes (To be confirmed) ○ Access conditions CC-BY-SA (To be confirmed)
6. Data repository 6.1. Name 6.2. Description 6.3. Link **6.4.** Properties 6.5. Access	○ Name Zenodo (To be confirmed) ○ Description https://about.zenodo.org/ (To be confirmed) ○ Link https://zenodo.org/ (To be confirmed) ○ Properties Existing (To be confirmed) External (To be confirmed) Public (To be confirmed) Security as described in: https://about.zenodo.org/infrastructure/ (To be confirmed) ○ Access Openly accessible through open APIs (To be confirmed) API documentation available (To be confirmed) Login required (To be confirmed)

All physical properties of the model tested	
1. Responsible party 1.1. Role of partners 1.2. Responsible party 1.3. Responsible person	○ Responsible party role Sintef Ocean is responsible for collecting the data and CTC is responsible for storing the data. ○ Responsible party Sintef Ocean ○ Responsible person Nuno Fonseca
2. Data Provenance 2.1. Description 2.2. External datasets 2.3. Internal datasets 2.4. Tools	○ Description Hull geometry is property of SAITEC and it is provided directly by SAITEC to the project. The model is designed to the prototype specifications and following Froude scaling. All mass properties of the floater and tower are identified before the model tests by Sintef Ocean. The weight of the model is measured with a weight balance and checked with the waterline markers with the model in the water. Moments of inertia are identified with swing tests and/or numerical estimation. The height of centre of gravity is identified by inclination tests with the model in the water. Regarding the mooring system, all segments of the mooring lines identified in terms of: length, stiffness properties, weight in water an in air. The restoring properties of the mooring system are identified with pull out tests. ○ External datasets Not applicable ○ Internal datasets Not applicable ○ Model/Tool Not applicable
3. Intended use 3.1. Description 3.2. Related enablers/components 3.3. Interrelations	○ Description The dataset will be used for the construction of the model to be tested in the water tank (Sintef Ocean's Ocean Basin Laboratory). ○ Related enablers/components Not applicable ○ Interrelations Not applicable
4. Data description 4.1. Dataset information 4.2. Parameter information 4.3. Storage 4.4. Metadata	○ Dataset information To be defined ○ Parameter information Not applicable ○ Storage To be defined ○ Meatadata

	To be defined
5. Data management 5.1. Availability 5.2. Owner 5.3. Open Access 5.4. Access conditions	○ Availability Data will be produced in the MooringSense project ○ Owner SAITEC and Sintef Ocean (To be confirmed). ○ Open Access No. Parameters are closely related to SATH concept design (IP of Saitec), consequently the dataset is considered confidential. ○ Access conditions Non disclosure
6. Data repository 6.1. Name 6.2. Description 6.3. Link **6.4.** Properties 6.5. Access	○ Name Not applicable ○ Description Internal ○ Link Not applicable ○ Properties Internal ○ Access Restricted to MooringSense consortium

Calibrated waves, current and wind (for selected conditions)	
1. Responsible party 1.1. Role of partners 1.2. Responsible party 1.3. Responsible person	○ Responsible party role Sintef Ocean is responsible for collecting the data and CTC is responsible for storing the data. ○ Responsible party Sintef Ocean ○ Responsible person Nuno Fonseca
2. Data Provenance 2.1. Description 2.2. External datasets 2.3. Internal datasets 2.4. Tools	○ Description As part of the water tank testing an environmental calibration will be performed. This calibration will consist of sixteen periodic waves will be calibrated, including systematic variation of the wave amplitude and conditions with and without current. Regarding irregular waves, several irregular seastates will be calibrated, covering one broad band seastate, ultimate limite seastates (ULS) and operational seastates, with and without current. The final matrix of waves to calibrate will be decided during the preparation of the model tests, therefore the numbers above are tentative. To be confirmed ○ External datasets Not applicable ○ Internal datasets Not applicable ○ Model/Tool Not applicable
3. Intended use 3.1. Description 3.2. Related enablers/components 3.3. Interrelations	○ Description Environmental calibration ○ Related enablers/components Closed Loop Controller, FOWT coupled numerical model, SHM system and Smart Motion Sensor ○ Interrelations Not applicable
4. Data description 4.1. Dataset information 4.2. Parameter information 4.3. Storage 4.4. Metadata	○ Dataset information To be defined ○ Parameter information Calibrated wave elevation time histories at three positions in the ocean basin. Mean current velocity. ○ Storage To be defined ○ Meatadata To be defined
5. Data management 5.1. Availability	○ Availability The data will be produced in the MooringSense project

5.2. Owner 5.3. Open Access 5.4. Access conditions	○ Owner Sintef Ocean ○ Open Access Yes (To be confirmed) ○ Access conditions CC-BY-SA (To be confirmed)
6. Data repository 6.1. Name 6.2. Description 6.3. Link **6.4.** Properties 6.5. Access	○ Name Zenodo (To be confirmed) ○ Description https://about.zenodo.org/ (To be confirmed) ○ Link https://zenodo.org/ (To be confirmed) ○ Properties Existing (To be confirmed) External (To be confirmed) Public (To be confirmed) Security as described in: https://about.zenodo.org/infrastructure/ (To be confirmed) ○ Access Openly accessible through open APIs (To be confirmed) API documentation available (To be confirmed) Login required (To be confirmed)

Model test results (for the selected conditions)	
1. Responsible party 1.1. Role of partners 1.2. Responsible party 1.3. Responsible person	○ Responsible party role Sintef Ocean is responsible for collecting the data and CTC is responsible for storing the data. ○ Responsible party Sintef Ocean ○ Responsible person Nuno Fonseca
2. Data Provenance 2.1. Description 2.2. External datasets 2.3. Internal datasets 2.4. Tools	○ Description The dataset will be generated through a water tank testing campaign that will consist of several different conditions: - Tests in periodic waves (with and without current). - Tests in irregular waves and intact mooring system - Tests in irregular waves and fault scenarios - Tests in irregular waves and control strategies for reduced mooring line loads ○ External datasets Not applicable ○ Internal datasets Not applicable ○ Model/Tool Not applicable
3. Intended use 3.1. Description 3.2. Related enablers/components 3.3. Interrelations	○ Description The tank testing campaign with the scaled model will provide data that will be used to: 1) Tune and validate the high fidelity coupled numerical model of the FOWT, 2) Tune and validate closed loop control algorithms, 3) Assess and validate the ability of the smart sensor together with the SHM system to identify system failures, unexpected degradation of mooring lines and other unexpected events. ○ Related enablers/components Closed Loop Controller, FOWT coupled numerical model, SHM system and Smart Motion Sensor ○ Interrelations Input for SHM and Smart Motion Sensor Output for FOWT coupled numerical model and closed loop controller
4. Data description 4.1. Dataset information 4.2. Parameter information 4.3. Storage 4.4. Metadata	○ Dataset information To be defined ○ Parameter information Time signals from model tests with: wave elevation, relative wave motions, motions of the platform, mooring line tensions, accelerations on the platform. ○ Storage To be defined

	○ Meatadata To be defined
5. Data management 5.1. Availability 5.2. Owner 5.3. Open Access 5.4. Access conditions	○ Availability The data will be produced in the MooringSense project ○ Owner Sintef Ocean ○ Open Access Yes (To be confirmed) ○ Access conditions CC-BY-SA (To be confirmed)
6. Data repository 6.1. Name 6.2. Description 6.3. Link **6.4.** Properties 6.5. Access	○ Name Zenodo (To be confirmed) ○ Description https://about.zenodo.org/ (To be confirmed) ○ Link https://zenodo.org/ (To be confirmed) ○ Properties Existing (To be confirmed) External (To be confirmed) Public (To be confirmed) Security as described in: https://about.zenodo.org/infrastructure/ (To be confirmed) ○ Access Openly accessible through open APIs (To be confirmed) API documentation available (To be confirmed) Login required (To be confirmed)

Simulated results for selected conditions	
1. Responsible party 1.1. Role of partners 1.2. Responsible party 1.3. Responsible person	○ Responsible party role Sintef Ocean is responsible for collecting the data and CTC is responsible for storing the data. ○ Responsible party Sintef Ocean ○ Responsible person Nuno Fonseca
2. Data Provenance 2.1. Description 2.2. External datasets 2.3. Internal datasets 2.4. Tools	○ Description The dataset will be generated through simulations with the FOWT coupled numerical model. This dataset will include simulation results under several operational and environmental conditions. ○ External datasets Not applicable ○ Internal datasets Not applicable ○ Model/Tool Not applicable
3. Intended use 3.1. Description 3.2. Related enablers/components 3.3. Interrelations	○ Description The dataset will be provided to allow the development of the SHM solution and the smart sensor, as well as, for the validation of the developed FOWT numerical model. ○ Related enablers/components FOWT numerical model, Smart Motion Sensor, SHM system and Closed Loop Controller ○ Interrelations The dataset is the output of the FOWT numerical model and the input for the development of the Smart Motion Sensor, the SHM system and the Closed Loop Controller.
4. Data description 4.1. Dataset information 4.2. Parameter information 4.3. Storage 4.4. Metadata	○ Dataset information To be defined ○ Parameter information Time signals from simulations with: incident wave elevation, wind velocity and direction, motions of the platform, mooring line tensions, wind turbine working parameters to be defined. To be defined ○ Storage To be defined ○ Meatadata To be defined
5. Data management 5.1. Availability	○ Availability Data will be produced in the MooringSense project

5.2. Owner 5.3. Open Access 5.4. Access conditions	○ Owner Sintef Ocean ○ Open Access No. Parameters contained in this dataset are closely related to SATH concept design and Simulation tool performance. Since both things are intended for future exploitation the dataset is considered confidential. ○ Access conditions Non disclosure
6. Data repository 6.1. Name 6.2. Description 6.3. Link **6.4.** Properties 6.5. Access	○ Name Not applicable ○ Description Internal ○ Link Not applicable ○ Properties Internal ○ Access Restricted to MooringSense consortium

2.2 Data in WP4

2.2.1 Datasets in WP4

GNSS measurements from tests in a motion simulator	
1. Responsible party 1.1. **Role of partners** 1.2. **Responsible party** 1.3. **Responsible person**	○ Responsible party role CTC will be responsible for collecting and storing the data ○ Responsible party CTC ○ Responsible person María Campo-Cossío
2. Data Provenance 2.1. **Description** 2.2. **External datasets** 2.3. **Internal datasets** 2.4. **Tools**	○ Description A two-axis rotary table will be used to implement controlled movements to one or several GNSS antennas. The rotary table will implement low dynamic motion profiles with precise final positions. The setup will include at least a low-cost receiver and antenna (the one that will be used in the smart motion sensor) and a high-end GNSS receiver and antenna for comparison purposes. Additionally, an Inertial Measurement Unit will be used in some cases. ○ External datasets Not applicable ○ Internal datasets Not applicable ○ Model/Tool To be defined. Some of the advanced post-processing algorithms foreseen to be used to generate reference solution dataset: - CSRS-PPP: online PPP post-processing tool developed at the Canadian Geodetic Survey of Natural Resources Canada (NRCan). - BNC: BKG Ntrip Client, developed at the Frankfurt Federal Agency of Cartography and Geodesy (BKG) - PPP-Wizard: proof of concept of the zero-difference ambiguity resolution method, develop in the Orbit Determination Service at CNES. - Bernese: Commercial data processing software developed at the Astronomical Institute of the University of Bern. - GAMIT-GLOBK: developed at the Massachusetts Institute of Technology, - GIPSY-OASIS II: automated, fast and ultra-precise data processing software developed at the NASA JPL. Focuses on GPS, GLONASS and DORIS. - RTKLib: open source program package that provides a range of standard and high precision positioning algorithms for both real-time and post-processing.
3. Intended use 3.1. **Description**	○ Description The raw measurements obtained with the GNSS sensors

3.2. **Related enablers/components** 3.3. **Interrelations**	(receiver and antenna) will be used to develop and validate precise positioning algorithms such as PPP and RTK for the smart sensor. For the validation of the sensor, the results obtained will be compared with the ones obtained with a high-end reference receiver and advanced post-processing algorithms. ○ Related enablers/components Smart motion sensor algorithms ○ Interrelations The dataset will include both inputs and outputs. The inputs will consist in multi-frequency, multi-constellation GNSS raw measurements from different receivers, external corrections and, in some cases, inertial sensors measurements (3D linear accelerations and angular rates). The output will be the computed position and attitude
4. Data description 4.1. **Dataset information** 4.2. **Parameter information** 4.3. **Storage** 4.4. **Metadata**	○ Dataset information To be defined ○ Parameter information <u>GNSS parameters</u> GNSS main observations: - Pseudo-range (PR): is the distance from the receiver antenna to the satellite antenna including receiver and satellite clock offsets (and other biases, such as atmospheric delays). PR = distance + c * (receiver clock offset - satellite clock offset + other biases) - Carrier-Phase is the measure of the range between a satellite and receiver expressed in units of cycles of the carrier frequency. They are not corrected for external effects like atmospheric refraction, satellite clock offsets, etc - Doppler Shift measurement is the change in frequency for a GNSS receive which is moving relative to a given GNSS satellite. The sign of the doppler shift as additional observable is defined as usual: Positive for approaching satellites GNSS time of the measurement is the receiver time of the received signals. It is identical for the phase and range measurements and is identical for all satellites observed at that epoch. GNSS Ephemeris is the precise orbital information for the transmitting satellites. GNSS Almanac is status and low-resolution orbital information for every satellite. GNSS orbit and clock corrections (Real Time products) Other GNSS corrections: earth rotation, ionospheric product, zenith path delay products, etc. Inertial Sensors Measurements: 3D (x, y, z) linear accelerations and 3D angular rates <u>Inertial Sensors Measurements</u> x, y, z Accelerations x, y, z Angular Rates <u>Computed solution</u> Position [geodetic]: Latitude, Longitude, Height (e.g. WGS84

	ellipsoid) Velocity [m/s]: x, y and z (body frame) Attitude [º]: Roll, Pitch and Yaw Time [s]: GNSS time ○ Storage a) format Plain text. Specific format depending on the type of information: - RINEX v3 will be used for GNSS measurements - RTCM for real-time correction data (may be stored as a plain text source table and RINEX files with the corrections data streams) - IGS formats for non real-time products, i.e., for orbit products: EPH, ERP, SP3, SUM; for clock products: CLK, CLK_30, CLS. b) Size (kB, MB), To be definedIt will depend on the number and duration of the tests. Rough figures are provided below that can be used for estimation: - Real time corrections ~= 6 MB/h - Non real-time corrections ~= 30 MB/day - GNSS ~= 8 MB/h c) direct link to dataset To be defined ○ Metadata To be defined
5. Data management 5.1. **Availability** 5.2. **Owner** 5.3. **Open Access** 5.4. **Access conditions**	○ Availability Data will be produced/gathered in the MooringSense project ○ Owner CTC ○ Open Access Yes ○ Access conditions CC-BY-SA (To be confirmed)
6. Data repository 6.1. **Name** 6.2. **Description** 6.3. **Link** **6.4. Properties** 6.5. **Access**	○ Name Zenodo (To be confirmed) ○ Description https://about.zenodo.org/ (To be confirmed) ○ Link https://zenodo.org/ (To be confirmed) ○ Properties Existing (To be confirmed) External (To be confirmed) Public (To be confirmed) Security as described in: https://about.zenodo.org/infrastructure/ (To be confirmed) ○ Access Openly accessible through open APIs (To be confirmed)

	API documentation available (To be confirmed) Login required (To be confirmed)

GNSS measurements from tests with a GNSS signal simulator	
1. Responsible party 1.1. Role of partners 1.2. Responsible party 1.3. Responsible person	○ Responsible party role CTC will be responsible for collecting and storing the data ○ Responsible party CTC ○ Responsible person María Campo-Cossío
2. Data Provenance 2.1. Description 2.2. External datasets 2.3. Internal datasets 2.4. Tools	○ Description A GNSS signal simulator will be used to generate signals to feed the GNSS receivers. The inputs to the simulator will be estimated motion of the receivers in realistic operational conditions. The setup will include at least a low-cost receiver (the one that will be used in the smart motion sensor) and a high-end GNSS receiver for comparison purposes. ○ External datasets Not applicable ○ Internal datasets Not applicable ○ Model/Tool To be defined. Some alternatives for advanced post-processing algorithms foreseen to be used to generate reference solution dataset: - CSRS-PPP: online PPP post-processing tool developed at the Canadian Geodetic Survey of Natural Resources Canada (NRCan). - BNC: BKG Ntrip Client, developed at the Frankfurt Federal Agency of Cartography and Geodesy (BKG) - PPP-Wizard: proof of concept of the zero-difference ambiguity resolution method, develop in the Orbit Determination Service at CNES. - Bernese: Commercial data processing software developed at the Astronomical Institute of the University of Bern. - GAMIT-GLOBK: developed at the Massachusetts Institute of Technology, - GIPSY-OASIS II: automated, fast and ultra-precise data processing software developed at the NASA JPL. Focuses on GPS, GLONASS and DORIS. - RTKLib: open source program package that provides a range of standard and high precision positioning algorithms for both real-time and post-processing.
3. Intended use 3.1. Description 3.2. Related enablers/components 3.3. Interrelations	○ Description Raw measurements obtained with the GNSS sensors (receiver and antenna) will be used to develop and validate precise positioning algorithms such as PPP and RTK for the smart sensor. For the validation of the sensor, the results obtained will be compared with the ones obtained with a high-end reference receiver and advanced post-processing algorithms.

	○ Related enablers/components Smart motion sensor ○ Interrelations The dataset will include both inputs and outputs. The inputs will consist in the motion measurements (obtained in the Ocean Basin Laboratory, that will be obtained during WP3 using optical high precision tools and up scaled to the real platform dimensions) that will be used to generate synthetic signals by the GNSS simulator, multi-frequency, multi-constellation GNSS raw measurements gathered from different receivers and external corrections. The output will be the computed positions and attitudes.
4. Data description 4.1. Dataset information 4.2. Parameter information 4.3. Storage 4.4. Metadata	○ Dataset information To be defined ○ Parameter information <u>Motion input</u> Positions and timestamps describing the motion of each measurement point of the structure (antennas positions). <u>GNSS parameters</u> GNSS main observations: - Pseudo-range (PR): is the distance from the receiver antenna to the satellite antenna including receiver and satellite clock offsets (and other biases, such as atmospheric delays). PR = distance + c * (receiver clock offset - satellite clock offset + other biases) - Carrier-Phase is the measure of the range between a satellite and receiver expressed in units of cycles of the carrier frequency. They are not corrected for external effects like atmospheric refraction, satellite clock offsets, etc - Doppler Shift measurement is the change in frequency for a GNSS receive which is moving relative to a given GNSS satellite. The sign of the doppler shift as additional observable is defined as usual: Positive for approaching satellites GNSS time of the measurement is the receiver time of the received signals. It is identical for the phase and range measurements and is identical for all satellites observed at that epoch. GNSS Ephemeris is the precise orbital information for the transmitting satellites. GNSS Almanac is status and low-resolution orbital information for every satellite. GNSS orbit and clock corrections (Real Time products) Other GNSS corrections: earth rotation, ionospheric product, zenith path delay products, etc. Inertial Sensors Measurements: 3D (x, y, z) linear accelerations and 3D angular rates <u>Computed solution</u> Position [geodetic]: Latitude, Longitude, Height (e.g. for WGS84 ellipsoid) Velocity [m/s]: x, y and z Attitude [º]: Roll. Pitch and Yaw

	Time [s]: GNSS time ○ Storage d) format Plain text. Specific format depending on the type of information: - RINEX v3 will be used for GNSS measurements - RTCM for real-time correction data (may be stored as a plain text source table and RINEX files with the corrections data streams) - IGS formats for non real-time products, i.e., for orbit products: EPH, ERP, SP3, SUM; for clock products: CLK, CLK_30, CLS. e) Size (kB, MB), The estimated size will be 100MB-250MB (To be defined). It will depend on the number and duration of the tests. Rough figures are provided below that can be used for estimation: - Real time corrections ~= 6 MB/h - Non real-time corrections ~= 30 MB/day - GNSS ~= 8 MB/h f) direct link to dataset To be defined ○ Metadata To be defined
5. Data management 5.1. Availability 5.2. Owner 5.3. Open Access 5.4. Access conditions	○ Availability Data will be produced in the MooringSense project ○ Owner CTC ○ Open Access Yes ○ Access conditions CC-BY-SA (To be confirmed)Data will be produced/gathered in the MooringSense project
6. Data repository 6.1. Name 6.2. Description 6.3. Link **6.4.** Properties 6.5. Access	○ Name Zenodo (To be confirmed) ○ Description https://about.zenodo.org/ (To be confirmed) ○ Link https://zenodo.org/ (To be confirmed) ○ Properties Existing (To be confirmed) External (To be confirmed) Public (To be confirmed) Security as described in: https://about.zenodo.org/infrastructure/ (To be confirmed) ○ Access Openly accessible through open APIs (To be confirmed) API documentation available (To be confirmed) Login required (To be confirmed)

GNSS measurements from tests at sea	
1. Responsible party 1.1. Role of partners 1.2. Responsible party 1.3. Responsible person	○ Responsible party role CTC will be responsible for collecting and storing the data. ZUNIBAL will be responsible for the set-up ○ Responsible party CTC ○ Responsible person María Campo-Cossío
2. Data Provenance 2.1. Description 2.2. External datasets 2.3. Internal datasets 2.4. Tools	○ Description The smart motion sensors will be mounted at the platform in known locations and will register the actual platform dynamics. The setup will also include high-end GNSS receiver and antenna for comparison purposes. As the final step in the validation of the smart motion sensor it will be installed on a floating platform (to be defined) to gather motion measurements in real environment. Measurements will consist of multi-constellation. ○ External datasets Not applicable ○ Internal datasets Not applicable ○ Model/Tool To be determined. Some alternatives for available post-processing algorithms foreseen to be used to generate reference solution dataset: - CSRS-PPP: online PPP post-processing tool developed at the Canadian Geodetic Survey of Natural Resources Canada (NRCan). - BNC: BKG Ntrip Client, developed at the Frankfurt Federal Agency of Cartography and Geodesy (BKG) - PPP-Wizard: proof of concept of the zero-difference ambiguity resolution method, develop in the Orbit Determination Service at CNES. - Bernese: Commercial data processing software developed at the Astronomical Institute of the University of Bern. - GAMIT-GLOBK: developed at the Massachusetts Institute of Technology, - GIPSY-OASIS II: automated, fast and ultra-precise data processing software developed at the NASA JPL. Focuses on GPS, GLONASS and DORIS. - RTKLib: open source program package that provides a range of standard and high precision positioning algorithms for both real-time and post-processing.
3. Intended use 3.1. Description 3.2. Related enablers/components 3.3. Interrelations	○ Description Data will be collected at sea on a floating platform and will be used for the validation of the smart motion sensor in relevant conditions. ○ Related enablers/components

	Smart motion sensor algorithms Smart motion sensor ○ Interrelations The dataset will include both inputs and outputs. The inputs will consist in multi-frequency, multi-constellation GNSS raw measurements gathered from different receivers and external corrections. The output will be the computed positions and attitudes. The dataset will be the output of the smart motion sensor.
4. Data description 4.1. Dataset information 4.2. Parameter information 4.3. Storage 4.4. Metadata	○ Dataset information To be defined ○ Parameter information <u>GNSS parameters</u> GNSS main observations: - Pseudo-range (PR): is the distance from the receiver antenna to the satellite antenna including receiver and satellite clock offsets (and other biases, such as atmospheric delays). PR = distance + c * (receiver clock offset - satellite clock offset + other biases) - Carrier-Phase is the measure of the range between a satellite and receiver expressed in units of cycles of the carrier frequency. They are not corrected for external effects like atmospheric refraction, satellite clock offsets, etc - Doppler Shift measurement is the change in frequency for a GNSS receive which is moving relative to a given GNSS satellite. The sign of the doppler shift as additional observable is defined as usual: Positive for approaching satellites GNSS time of the measurement is the receiver time of the received signals. It is identical for the phase and range measurements and is identical for all satellites observed at that epoch. GNSS Ephemeris is the precise orbital information for the transmitting satellites. GNSS Almanac is status and low-resolution orbital information for every satellite. GNSS orbit and clock corrections (Real Time products) Other GNSS corrections: earth rotation, ionospheric product, zenith path delay products, etc. Inertial Sensors Measurements: 3D (x, y, z) linear accelerations and 3D angular rates <u>Inertial Sensors Measurements</u> x, y, z Accelerations x, y, z Angular Rates <u>Computed solution</u> Position [geodetic]: Latitude, Longitude, Height (e.g. WGS84 ellipsoid) Velocity [m/s]: x, y and z (body frame) Attitude [º]: Roll. Pitch and Yaw Time [s]: GNSS time ○ Storage g) format

	Plain text. Specific format depending on the type of information: - RINEX v3 will be used for GNSS measurements - RTCM for real-time correction data (may be stored as a plain text source table and RINEX files with the corrections data streams) - IGS formats for non real-time products, i.e., for orbit products: EPH, ERP, SP3, SUM; for clock products: CLK, CLK_30, CLS. h) Size (kB, MB), The estimated size will be 2000MB-4000MB (To be defined). It will depend on the number and duration of the tests. Rough figures are provided below that can be used for estimation: - Real time corrections ~= 6 MB/h - Non real-time corrections ~= 30 MB/day - GNSS ~= 8 MB/h i) direct link to dataset To be defined ○ Metadata To be defined
5. Data management 5.1. Availability 5.2. Owner 5.3. Open Access 5.4. Access conditions	○ Availability Data will be produced in the MooringSense project ○ Owner CTC and ZUNIBAL ○ Open Access Yes ○ Access conditions ○ CC-BY-SA (To be confirmed)
6. Data repository 6.1. Name 6.2. Description 6.3. Link **6.4.** Properties 6.5. Access	○ Name Zenodo (To be confirmed) ○ Description https://about.zenodo.org/ (To be confirmed) ○ Link https://zenodo.org/ (To be confirmed) ○ Properties Existing (To be confirmed) External (To be confirmed) Public (To be confirmed) Security as described in: https://about.zenodo.org/infrastructure/ (To be confirmed) ○ Access Openly accessible through open APIs (To be confirmed) API documentation available (To be confirmed) Login required (To be confirmed)

2.3 Data in WP5

2.3.1 Datasets in WP5

SHM based on GNSS measurements from Ocean Basin Laboratory	
1. Responsible party 1.1. Role of partners 1.2. Responsible party 1.3. Responsible person	○ Responsible party role IKERLAN will be responsible for collecting and storing the data. IKERLAN will be responsible for the set-up ○ Responsible party IKERLAN ○ Responsible person Jon Basurko
2. Data Provenance 2.1. Description 2.2. External datasets 2.3. Internal datasets 2.4. Tools	○ Description The dataset contains the output generated by the SHM algorithms. The datasets can be divided into simulation and test data obtained from the model test at the ocean basin laboratory (WP3, WP4). ○ External datasets Not applicable ○ Internal datasets The SHM algorithms use the datasets from WP3 (Model test results for the selected conditions and Simulated results for selected conditions) and WP4 (GNSS measurements from tests with a GNSS signal simulator, GNSS measurements from tests at sea) as input. ○ Model/Tool To be defined.
3. Intended use 3.1. Description 3.2. Related enablers/components 3.3. Interrelations	○ Description The dataset is used to take decisions about damage detection and localization. ○ Related enablers/components The dataset will be used for the development of the next enablers: decision part of the SHM system. ○ Interrelations The dataset is used as input for damage detection and localization decisions.
4. Data description 4.1. Dataset information 4.2. Parameter information 4.3. Storage 4.4. Metadata	○ Dataset information To be defined ○ Parameter information To be defined ○ Storage To be defined ○ Meatadata To be defined
5. Data management	○ Availability Data will be produced in the MooringSense project

5.1. Availability 5.2. Owner 5.3. Open Access 5.4. Access conditions	○ Owner IKERLAN ○ Open Access Yes ○ Access conditions CC-BY-SA (To be confirmed)
6. Data repository 6.1. Name 6.2. Description 6.3. Link **6.4.** Properties 6.5. Access	○ Name Zenodo (To be confirmed) ○ Description https://about.zenodo.org/ (To be confirmed) ○ Link https://zenodo.org/ (To be confirmed) ○ Properties Existing (To be confirmed) External (To be confirmed) Public (To be confirmed) Security as described in: https://about.zenodo.org/infrastructure/ (To be confirmed) ○ Access Openly accessible through open APIs (To be confirmed) API documentation available (To be confirmed) Login required (To be confirmed)

2.4 Data in WP6

2.4.1 Datasets in WP6

Simulation results for the control development at FOWT level	
1. Responsible party 1.1. Role of partners 1.2. Responsible party 1.3. Responsible person	○ Responsible party role IKERLAN will be responsible for collecting and storing the data. IKERLAN will be responsible for the set-up ○ Responsible party IKERLAN ○ Responsible person Iker Elorza
2. Data Provenance 2.1. Description 2.2. External datasets 2.3. Internal datasets 2.4. Tools	○ Description The control algorithm implementations used for WP6 simulations, as well as those simulation data not subject to confidentiality clauses, i.e. those involving publicly available FOWT models. ○ External datasets To be defined ○ Internal datasets To be defined ○ Model/Tool To be defined
3. Intended use 3.1. Description 3.2. Related enablers/components 3.3. Interrelations	○ Description Simulation data will be used to evaluate control algorithm performance. ○ Related enablers/components Closed loop controller ○ Interrelations Output
4. Data description 4.1. Dataset information 4.2. Parameter information 4.3. Storage 4.4. Metadata	○ Dataset information To be defined ○ Parameter information To be defined ○ Storage To be defined ○ Meatadata To be defined
5. Data management 5.1. Availability 5.2. Owner 5.3. Open Access 5.4. Access conditions	○ Availability Data will be produced in the project ○ Owner IKERLAN ○ Open Access Yes

	○ Access condition s GPLv3 license (To be confirmed)
6. Data repository 6.1. Name 6.2. Description 6.3. Link **6.4.** Properties 6.5. Access	○ Name Zenodo (To be confirmed) ○ Description https://about.zenodo.org/ (To be confirmed) ○ Link https://zenodo.org/ (To be confirmed) ○ Properties Existing (To be confirmed) External (To be confirmed) Public (To be confirmed) Security as described in: https://about.zenodo.org/infrastructure/ (To be confirmed) ○ Access Openly accessible through open APIs (To be confirmed) API documentation available (To be confirmed) Login required (To be confirmed)

Simulation results for the control development at farm level	
1. Responsible party 1.1. Role of partners 1.2. Responsible party 1.3. Responsible person	○ Responsible party role TNO is responsible for collecting and storing data. ○ Responsible party TNO is the responsible partner within the consortium. ○ Responsible person Feike Savenije is the responsible person within the consortium.
2. Data Provenance 2.1. Description 2.2. External datasets 2.3. Internal datasets 2.4. Tools	○ Description The dataset will be generated during the evaluation of wind farm control strategies in MooringSense WP6. It contains results of the wind farm power production estimates for the selected sites generated with the TNO model FarmFlow. The dataset includes at least the baseline results without wind farm control and the results with a selected farm control strategy (as described in the project deliverable D6.6) ○ External datasets - The following external data has been used as input:DTU 10MW RWT model description/files (add link) - Metocean data of the wind farm sites (add link) ○ Internal datasets Not applicable ○ Model/Tool The model used for the dataset is the wind farm flow simulator FarmFlow (add link)
3. Intended use 3.1. Description 3.2. Related enablers/components 3.3. Interrelations	○ Description The generated power production estimates will be used to evaluate the impact of floating wind farm control strategies in general and in WP7 as part of MooringSense impact. ○ Related enablers/components Control strategies and algorithms for FOW farms. ○ Interrelations The dataset will consist of inputs (e.g. Metocean data) and outputs (e.g. Energy production) related to the developed control strategies. To be confirmed.
4. Data description 4.1. Dataset information 4.2. Parameter information 4.3. Storage 4.4. Metadata	○ Dataset information To be defined ○ Parameter information To be defined ○ Storage To be defined ○ Meatadata To be defined
5. Data management 5.1. Availability	○ Availability Data will be produced in the MooringSense project

5.2. Owner 5.3. Open Access 5.4. Access conditions	○ Owner The owner of the data is TNO. ○ Open Access Yes ○ Access conditions To be defined.
6. Data repository 6.1. Name 6.2. Description 6.3. Link **6.4.** Properties 6.5. Access	○ Name Zenodo (To be confirmed) ○ Description https://about.zenodo.org/ (To be confirmed) ○ Link https://zenodo.org/ (To be confirmed) ○ Properties Existing (To be confirmed) External (To be confirmed) Public (To be confirmed) Security as described in: https://about.zenodo.org/infrastructure/ (To be confirmed) ○ Access Openly accessible through open APIs (To be confirmed) API documentation available (To be confirmed) Login required (To be confirmed)

2.5 Data in WP7

Within WP7 TNO's cost modelling tool will be improved in several aspects. One of the main improvements will consist in the addition of more detailed information related to the floating platform and the mooring system, also including O&M costs. Costs figures are considered an important dataset that will be generated within the MooringSense project.

The costs dataset that will be produced in WP7 will include information for the assessment of costs under a Life Cycle approach. Data will be related to some commercially available products (i.e. mooring chains, polyester ropes and connectors), and to the SATH floating platform concept which is currently under development.

Information related to costs is considered confidential by the owners/providers of the data: Vicinay Marine Innovación, Bekaert Wire Rope Industry and Saitec, since publication could have a negative impact on present/future commercialization/exploitation.

On the other hand, costs dataset will be managed according to the policy explained in this document.

2.5.1 Datasets in WP7

Datasets in WP7 will be described when more information become available.

3. FAIR data

MooringSense's data management policy is based on FAIR data management principles [1], and consequently it is aimed at making research data findable, accessible, interoperable and re-usable. Data Management Policy has been developed in accordance to open data requirements [2] and following best practices and implementation guidelines provided by the EC [3][4].

MooringSense's data management policy apply to new data the project will generate and that are to be shared by the consortium as open data.

3.1 Making data findable, including provisions for metadata

3.1.1 Are the data produced and/or used in the project discoverable with metadata, identifiable and locatable by means of a standard identification mechanism (e.g. persistent and unique identifiers such as Digital Object Identifiers)?

All open data produced in MooringSense will be identifiable and locatable by means of an assigned Digital Object Identifier (DOI). DOIs are persistent identifiers that are used to permanently and unambiguously identify digital objects such as journal articles, research reports and data sets to which the identifier is associated. DOIs of MooringSense's open datasets will also associate metadata to provide researchers/users with relevant pieces of information about the objects and their relationships (See section 3.1.5).

Since DOI system is implemented through a federation of registration agencies (https://www.doi.org/registration_agencies.html) coordinated by the International DOI Foundation, and these agencies have associated DOI registrants. MooringSense consortium will get DOIs assigned through Zenodo [5], which is the open access repository of the Open Access Infrastructure for Research in Europe, OpenAIRE [6] and an authorized DOI registrant.

3.1.2 What naming conventions do you follow?

File names will include at least a version number and a time stamp.

3.1.3 Will search keywords be provided that optimize possibilities for re-use?

Open MooringSense's datasets will include search keywords together with their metadata (see 3.1.5). Keywords for open data will be selected from controlled vocabularies that are suitable for the specific type of the data (see Appendix B).

3.1.4 Do you provide clear version numbers?

Open datasets will be provided with version numbers that will follow the semantic versioning schema (http://semver.org). Besides, all datasets deposited in the Zenodo repository will use DOI versioning. DOI versioning allows for updating a dataset after it has been published and to cite either a specific version of a dataset or all versions of a dataset (see https://blogs.OpenAIRE.eu/?p=2010).

3.1.5 What metadata will be created? In case metadata standards do not exist in your discipline, please outline what type of metadata will be created and how.

Since metadata significantly improves the data's findability and re-usability, it will be required to define a metadata scheme that fits all the different purposes intended within the MooringSense project. At this regard, the Zenodo metadata model, which is based on the domain-agnostic DataCite metadata scheme [7], will be used (see Appendix B for more informatio .

In MooringSense, the following deposition metadata fields are mandatory:

- **upload_type**: Type of the deposition from a controlled vocabulary (publication, dataset, software, ...).
- **publication_date**: Date of publication in ISO8601 format (YYYY-MM-DD).
- **Title**: Title of the deposition.
- **Creators**: The creators/authors of the deposition.
- **Description**: Abstract or description for deposition.
- **Access_right**: Access right from controlled vocabulary (open, embargoed)
- **License**: Open license from controlled vocabulary “Open Definition Licenses Service”
- **Doi**: Digital Object Identifier assigned by the DOI registrant (e.g. Zenodo), also used for versioning
- **Keywords**: Free form keywords for this deposition.
- **related_identifiers**: Persistent identifiers of related publications, datasets and software.
- **communities**: List of communities the deposition to appears in (https://zenodo.org/communities/clarity/)
- **grants**: List of European Commission grants which have funded the research for this deposition (851703).

3.2 Making data openly accessible

3.2.1 Which data produced and/or used in the project will be made openly available as the default? If certain datasets cannot be shared (or need to be shared under restrictions), explain why, clearly separating legal and contractual reasons from voluntary restrictions.

In general, **data access/use will be unrestricted** when no confidentiality or IPR issues exist. Open access will be provided to data files and metadata through ZENODO. In addition, use and reuse of data will be permitted, and privacy of its users will be kept. Embargo period will not apply unless datasets are linked to a green open access publication. Foreseen datasets under this category are shown in the following table:

Table 3.1: Types of data without access/use restrictions

WP	Types of data without access/use restrictions
WP3	FOWT model and performance (tests and simulations): - Videos and images of the model tests - Calibrated waves, current and wind (for selected conditions) - Model test results (for selected conditions)
WP4	Smart Motion Sensor measurements: - GNSS measurements obtained in a motion simulator - GNSS measurements obtained with a GNSS simulator
WP5	SHM data (inputs and outputs)

When commercial exploitation of project results and or IPR may be jeopardized, as a consequence of data publication, the access to the related datasets will be restricted to MooringSense partners. Nevertheless, a strategy of data aggregation might be followed in order to reduce such restrictions and to allow dissemination of project results through scientific publications. In these specific cases,

aggregated data will be disseminated at the same time as the scientific publication, or after the embargo period, if data were linked to a green open access publication.

Several data types include information that could harm future exploitation of existing IPR, mainly related to the design, performance and associated costs of the SATH Floating Offshore Wind Turbine concept, which is still under development.

The following table identifies the types of data with restricted access.

Table 3.2: Types of data with access/use restrictions

WP	Types of data with access/use restrictions
WP3	FOWT model and performance (tests and simulations): - All physical properties of the model tested - Simulated results for selected conditions
WP6	Control algorithms performance in simulations: - Simulation results for the control development at FOWT level (Task T6.2) for selected conditions - Simulation results for the control development at farm level (Task T6.3) for selected conditions
WP7	Costs: - Costs for cost modelling

3.2.2 Note that in multi-beneficiary projects it is also possible for specific beneficiaries to keep their data closed if relevant provisions are made in the consortium agreement and are in line with the reasons for opting out.

Currently, no beneficiary has the intention to opt-out from the open data pilot

3.2.3 How will the data be made accessible (e.g. by deposition in a repository)?

MooringSense open data will be made accessible according to the Rules on Open Access to Scientific Publications and Open Access to Research Data in Horizon 2020 [2]. Consequently, open research data generated within MooringSense will be deposited in an appropriate Open Access repository (i.e. OpenAIRE compliant) to make dataset openly accessible.

When open research data are linked to scientific publications (e.g. data needed for the validation of the presented results), data will be deposited in an Open Access Repository at the same time as the linked publication. In the specific case of Green Open Access publications, the underlying data will be open after the period of embargo (i.e. 6 months after publications).

Non-public research data will be archived at the MooringSense's repository and access will be restricted to MooringSense partners.

3.2.4 What methods or software tools are needed to access the data?

There are no special methods or software tools needed to access the data. The files can be downloaded from the data repository via HTTP protocol using a standard web browser.

Specific software and tools will be required for viewing, interpreting, processing and editing the open data files shared through the repository. Depending on the dataset any of the following software tools would be needed:

- MS Excel
- Matlab
- OpenDiscon
- OpenFAST
- Mp4 video player
- Jpg image viewer
- …

3.2.5 Is documentation about the software needed to access the data included?

Documentation of the required software tools needed to access the data is available.

3.2.6 Is it possible to include the relevant software (e.g. in open source code)?

In general, all the pieces of software developed within the MooringSense project are considered key components of the exploitable results. For instance, models of the FOWT for different purposes (virtual model of the moorings, closed-loop control, etc.) are classified as confidential information. Consequently, related source code will not be openly accessible.

On the other hand, a new and improved version of OpenDiscon will be made available for open access by IKERLAN.

3.2.7 Where will the data and associated metadata, documentation and code be deposited? Preference should be given to certified repositories which support open access where possible.

The default repository of the MooringSense project for depositing publications, open data and open source software is Zenodo [5]. Zenodo was created in 2013 by the OpenAIRE project and is a general-purpose Open Access repository which is co-founded by the EC. It is compliant with the open data requirements of Horizon 2020, the EU Research and Innovation funding programme and OpenAIRE. Zenodo allows researchers to deposit research data sets, software, reports, and any other research related digital object. Besides, a DOI is automatically assigned to all Zenodo files, which can be uploaded in any file format. Zenodo not only allows depositing publications and data, it also provides means to link them. As per data storage, data is kept in the CERN cloud infrastructure.

Finally, a MooringSense project page (community) will be set up for easy upload of project datasets.

3.2.8 Have you explored appropriate arrangements with the identified repository?

Currently, there is no need for arrangement.

3.2.9 If there are restrictions on use, how will access be provided?

Research data linked to exploitable results will not be made public, if its publication might jeopardize the future commercialization of project results. However, some parts could be made available in an aggregated way to allow the dissemination of project results. This might be the case of some scientific publications and their underlying data.

When an embargo period applies (i.e. “Green” open access publication), a restriction on open access to research data is necessary. Since data is stored in the Zenodo repository, information about the

restricted data will be published in the repository, and details of when the data will become available will be included in the metadata.

Metadata are always publicly available in Zenodo. Data files and data sets for restricted access records are only visible to their owners and to those the owner grants access. Restricted access allows a researcher to upload a dataset and provide the conditions under which he/she grants access to the data.

3.2.10 Is there a need for a data access committee?

So far, the need for a data access committee has not been identified.

3.2.11 Are there well described conditions for access (i.e. a machine readable license)?

Yes, Zenodo provides well described conditions for access. The license for open data as well as the conditions for access and possible embargo periods are distributed in machine-readable format as part of the metadata in Zenodo.

3.2.12 How will the identity of the person accessing the data be ascertained?

Firstly, users in Zenodo are requested to register in order to access open datasets.

On the other hand, restricted access allows a researcher to upload a dataset and provide the conditions under which he/she grants access to the data. In such cases, the identity/person that intends to gain access to restricted data stored in Zenodo will be requested to provide a justification of the fulfilment of these conditions. The owner of the dataset gets notified for each new request and can decide to either accept or reject the request. If the request is accepted, the requester receives a secret link, which usually expires within 1-12 months.

3.3 Making data interoperable

3.3.1 Are the data produced in the project interoperable, that is allowing data exchange and re-use between researchers, institutions, organisations, countries, etc. (i.e. adhering to standards for formats, as much as possible compliant with available (open) software applications, and in particular facilitating re-combinations with different datasets from different origins)?

The data produced in the project will be interoperable since most the datasets will adhere to standardised formats such as: txt, csv, xml, tiff, etc. If tools such as Microsoft Office, Acrobat pdf viewer or image viewer could not be used, a plain text file will be provided together with the dataset to indicate where an alternative open tool can be found.

On the other hand, datasets related to GNSS measurements will follow RINEX v3.00 [8] to allow and facilitate .data exchange and re-use between researchers and institutions.

3.3.2 What data and metadata vocabularies, standards or methodologies will you follow to make your data interoperable?

Open datasets in MooringSense will include metadata, according to Zenodo's model. Consequently, MooringSense's datasets will be interoperable as Zenodo's basic metadata requirement (i.e. 1) description, 2) creator / ownership, 3) access, 4) lifecycle, 5) persistent identifiers) is compliant with the recommended standards used by DataCite (https://search.datacite.org/) and OpenAIRE (https://www.base-search.net/).

3.3.3 Will you be using standard vocabularies for all data types present in your data set, to allow inter-disciplinary interoperability?

Standard vocabularies will be used for all datasets: to ensure inter-disciplinary interoperability and re-use. Some standards to be considered:

- IEEE thesaurus (https://www.ieee.org/content/dam/ieee-org/ieee/web/org/pubs/ieee-thesaurus.pdf),
- IEEE taxonomy https://www.ieee.org/content/dam/ieee-org/ieee/web/org/pubs/ieee-taxonomy.pdf)

3.3.4 In case it is unavoidable that you use uncommon or generate project specific ontologies or vocabularies, will you provide mappings to more commonly used ontologies?

MooringSense does not intend to introduce new project specific ontologies or vocabularies.

3.4 Increase data re-use (through clarifying licences)

3.4.1 How will the data be licensed to permit the widest re-use possible?

The data will either be licensed under a Creative Commons Attribution 4.0 (CC BY 4.0 https://creativecommons.org/licenses/by/4.0/legalcode). Consequently, users will be required to acknowledge the consortium and the source of the data in any resulting publications.

3.4.2 When will the data be made available for re-use? If an embargo is sought to give time to publish or seek patents, specify why and how long this will apply, bearing in mind that research data should be made available as soon as possible.

The data used in scientific publications, posters and oral communications will be made available for re-use as soon as is reasonably possible. For instance, for "Gold" Open Access publications, the underlying data will be openly accessible at the publication date, while for "Green" Open Access it will be after the period of embargo (i.e. 6 months after publication.

On the other hand, if the data were linked to a pending patent application a 18 months embargo period could be defined set.

3.4.3 Are the data produced and/or used in the project useable by third parties, in particular after the end of the project? If the re-use of some data is restricted, explain why.

All the open datasets will be useable by third parties. This measure applies not only to data published in open-access journals, but also to other open data produced within the project.

On the other hand, the re-use of restricted data will be limited on a case-by-case basis, since restricted data are supposed to be linked to exploitable results and their disclosure might harm future exploitation.

3.4.4 How long is it intended that the data remains re-usable?

According to Zenodo's Generl Policy, data "will be retained for the lifetime of the repository. This is currently the lifetime of the host laboratory CERN, which currently has an experimental programme defined for the next 20 years at least.The data will remain reusable for the lifetime of the repository, which is expected to be a minimum of 20 years".

3.4.5 Are data quality assurance processes described?

Data quality will be assured through:

- Redundant measurements (e.g. obtained with the same instrument and/or with additional sensors and alternative sources of information) and comparison (e.g. processed data obtained through different techniques, algorithms, etc.)
- Adherence to standards for data processing, recording,
- Use of controlled vocabularies and standard terminology, M
- Metrological characterisation of the sensors/instruments, as well as, the measurement set-ups
- Validation of the data collected.
- Provision of test results along with the data and the peer-review of publications based on the data.

4. Allocation of resources

4.1.1 What are the costs for making data FAIR in your project?

Since the selected open repository is Zenodo, which is a free repository, the expected costs are mainly related to personnel costs. The estimated costs for making the data Findable, Accessible, Interoperable and Reusable (FAIR) are 2,000 €.

4.1.2 How will these be covered? Note that costs related to open access to research data are eligible as part of the Horizon 2020 grant (if compliant with the Grant Agreement conditions).

The costs for making the data FAIR are included in the project's budget and are compliant with the Grant Agreement's conditions. Consequently, costs for making the data FAIR will be claimed accordingly.

4.1.3 Who will be responsible for data management in your project?

Each MooringSense partner must comply with the general policy and procedures described in this DMP, with the Grant Agreement and the Consortium Agreement, as well as, with the applicable legislation. Consequently, datasets must be created, managed and stored appropriately. CTC, as Project Coordinator and responsible for MooringSense website development and maintenance, has a particular responsibility to ensure that data shared through this site is easily available, but also that backups are performed and that proprietary data are secured.

On the other hand, validation and registration of datasets and metadata is the responsibility of the partner that generates the data in the WP. Backing up data for sharing through open access repositories is the responsibility of the partner owning the data. Quality control of these data is the responsibility of the relevant WP leader, supported by the Project Coordinator. If datasets are updated, the partner that owns the data has the responsibility to manage the different versions and to make sure that the latest version is available in the case of publicly available data.

Finally, all partners must consult the concerned partner(s) before publishing data in the open domain that can be associated to an exploitable result.

4.1.4 Are the resources for long term preservation discussed (costs and potential value, who decides and how what data will be kept and for how long)?

Firstly, there are no costs associated with the preservation of the data for the partners.

In addition, it is expected that value of data will increase over time since project results are focused on an emerging and growing sector such as the Floating Offshore Wind. More co

It will enable the technologies developed in the project to be taken up by the measurement supply chain and by standards bodies including ISO/TC193/SC1/WG25 Biomethane Working Group, ISO/TC 158 Analysis of Gases and regulators. These standards bodies will need access to the data to justify the robustness of future standards. The data will also be of value as it underpins the results of published datasets. The Data Management Committee will decide on what data will be kept and for how long.

5. Data security

5.1.1 What provisions are in place for data security (including data recovery as well as secure storage and transfer of sensitive data)?

Open results deposited in the Zenodo repository are stored in CERN's EOS service in an 18 petabytes disk cluster. EOS is the primary low latency storage infrastructure for physics data from the Large Hadron Collider (LHC) and CERN currently operates multiple instances totalling 150+ petabytes of data with expected growth rates of 30-50 petabytes per year.

In Zenodo, each file copy has two replicas located on different disk servers. For each file Zenodo stores two independent MD5 checksums. One checksum is stored by Invenio, and used to detect changes to files made from outside of Invenio. The other checksum is stored by EOS, and used for automatic detection and recovery of file corruption on disks

Finally, MooringSense partners will store data in the project shared repository and within their organisations' networks, which are protected by password-protected access, firewall, backups, etc.

5.1.2 Is the data safely stored in certified repositories for long-term preservation and curation?

Despite not being a certified open repository, Zenodo has a long standing and solid user base and consequently it is considered a safe repository. Besides, Zenodo is working towards ISO certification of its organisational and technical infrastructure which relies on for long-term preservation (https://blogs.openaire.eu/?p=1485).

6. Ethical aspects

6.1.1 Are there any ethical or legal issues that can have an impact on data sharing? These can also be discussed in the context of the ethics review. If relevant, include references to ethics deliverables and ethics chapter in the Description of the Action (DoA).

The issues related to ethical or legal aspect that might have an impact on data sharing are the following ones:

- Ethical issues related to potential harm to the environment caused by the research and innovation action.
- Ethical issues related to health and safety measures during water tank testing campaign

The two potential issues identified above are considered not very relevant for the MooringSense project. In the case of potential harm to the environment derived from the execution of the action, a deliverable was already submitted (D9.1 EPQ – Requirement No. 1) to explain the expected impacts and the measures taken to mitigate them and to reduce risks.

As per the health and safety, the MooringSense consortium will provide a report (D9.2 EPQ – Requirement No.2) to demonstrate that appropriate procedures will be followed by the staff involved in water tank testing. Procedures to follow will comply with relevant local/national legislation and guidelines.

6.1.2 Is informed consent for data sharing and long-term preservation included in questionnaires dealing with personal data?

The MooringSense project has no plans to gather or share data with identifiable personal information.

7. Other issues

7.1.1 Do you make use of other national/funder/sectorial/departmental procedures for data management? If yes, which ones?

The project does not make use of procedures for data management other than those described in this data management policy. Nevertheless, data management within MooringSense will be compliant with the European laws about data security and the protection of privacy (e.g. GDPR).

8. References

[1] Directorate-General for Research & Innovation, “Guidelines on FAIR Data Management in Horizon 2020, Version 3.0,” EUROPEAN COMMISSION, 26 July 2016: https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf

[2] Directorate-General for Research & Innovation, “Guidelines to the Rules on Open Access to Scientific Publications and Open Access to Research Data in Horizon 2020, Version 3.2,” European Commission, 2017 March 21: https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-pilot-guide_en.pdf

[3] European Research Council, “Guidelines on the Implementation of Open Access to Scientific Publications and Research Data in projects supported by the European Research Council under Horizon 2020, Version 1.1,” 7 April 2017: https://ec.europa.eu/research/participants/data/ref/h2020/other/hi/oa-pilot/h2020-hi-erc-oa-guide_en.pdf

[4] Clarity Project, “D7.8 Data Management Plan v1”, 30 November 2017: https://clarity-h2020.eu/sites/default/files/clarity/public/content-files/deliverables/CLARITY%20D7.8%20Data%20Management%20Plan%20v1.0-final2.pdf

[5] ZENODO repository. http://www.zenodo.org/

[6] OpenAIRE H2020 Project. https://www.openaire.eu/

[7] DataCite. https://www.datacite.org/

[8] RINEX. The Receiver Independent Exchange Format. Werner Gurtner. Astronomical Institute. University of Bern. November 2007. https://web.archive.org/web/20170713065129/http://ftp.unibe.ch/aiub/rinex/rinex300.pdf

Appendix A – Dataset Information Template

Title	
1. Responsible party 1.1. Role of partners 1.2. Responsible party 1.3. Responsible person	○ Responsible party role Description of the roles related to the dataset (e.g. Sintef ocean is responsible for collecting data. CTC is responsible for processing and storing the data) ○ Responsible party Identify the responsible partner within the consortium ○ Responsible person Identify the responsible person within the consortium
2. Data Provenance 2.1. Description 2.2. External datasets 2.3. Internal datasets 2.4. Tools	○ Description Description of the process that led to the production of the current dataset. This includes: input data (which input or other data are needed to produce this dataset) Links to Datasets (if possible) or external links to / description of external data Process or model (which process or model was / is used to process the input data and produce this data) Link to Model (if possible) or external link to / description of external model ○ External datasets Reference/Link to the external data that have been used for the creation of the current dataset ○ Internal datasets Reference/Link to the internal data that have been used for the creation of the current dataset. If the current dataset is produced by a model ("model output"), the links would point to the "model input" datasets. ○ Model/Tool Reference/Link to the model if an external model has been used to produce the current dataset.
3. Intended use 3.1. Description 3.2. Related enablers/components 3.3. Interrelations	○ Description How and for which purpose is the data used/produced in MooringSense? (E.g. Motion measurements obtained in the Ocean Basin Laboratory will be used for the development and validation of the SHM system in WP5) ○ Related enablers/components Identification of the enablers associated to the dataset. (E.g. Motion measurements obtained in the Ocean Basin Laboratory will be used for the development of the following enablers: 1)Smart Motion Sensor, 2) SHM system, 3) Closed Loop Controller) ○ Interrelations Description of the dataset relation to the identified enablers (e.g. the dataset might be input or output)
4. Data description 4.1. Dataset information 4.2. Parameter information 4.3. Storage 4.4. Metadata	○ Dataset information a) title b) naming conventions (e.g. $Source_$params_YYYY-MM.DD.csv), c) short description d) persistent and unique identifier such as Digital Object Identifiers (if available)

	○ Parameter information a) parameter names, b) parameter description c) units, d) source type (e.g. simulation, measurement, etc.), ○ Storage a) format, b) Size (kB, MB), c) direct link to dataset ○ Meatadata Keywords, etc.
5. Data management 5.1. Availability 5.2. Owner 5.3. Open Access 5.4. Access conditions	○ Availability a) Existing data b) Data will be produced in the MooringSense project, c) Data will be reused/extended ○ Owner Owner of the data if different from responsible partner or data is external. ○ Open Access a) Yes b) No Why is/won't be the dataset openly available? (if previous answer is no) ○ Access conditions a) License (e.g. CC-BY-SA, for research only, etc.) b) ordering, costs c) constraints, (e.g. software requirements, external expertise needed, ...) d) further restrictions on use (e.g. sensitive data, non disclosure, etc.)
6. Data repository 6.1. Name 6.2. Description 6.3. Link **6.4.** Properties 6.5. Access	○ Name Name of the Data Repository where the Data will be deposited (for open data produced by MooringSense) or can be downloaded (for data collected / used by MooringSense.) ○ Description Description of the Repository (e.g. whether institutional with open access, public, internal service or database, deposit at zenodo.org, REST service, to be provided by MooringSense, etc.) ○ Link Link to data repository ○ Properties a) new (to be set up by MooringSense) or existing repository (YES/NO) b) internal (provided by MooringSense or a partner) or external (e.g. zenodo.org) (YES/NO) c) public or restricted (YES/NO) d) sustainability of the repository (e.g. in case of internal/partner repo, what happens after the end of the project?) e) security (e.g. backups, replication, etc.) ○ Access a) Access methods (e.g. type of client or application needed to access the repository, e.g. WMS client) b) access documentation (e.g. API documentation available) c) availability access software

	d) access control and logging (e.g. no login required.)

Appendix B – Zenodo's metadata model

Attribute	Required	Description
Upload_type string	Yes	Controlled vocabulary: * publication: Publication * poster: Poster * presentation: Presentation * dataset: Dataset * image: Image * video: Video/Audio * software: Software * lesson: Lesson * other: Other
publication_type string	Yes, if upload_type is "publication"	Controlled vocabulary: * annotationcollection: Annotation collection * book: Book * section: Book section * conferencepaper: Conference paper * datamanagementplan: Data management plan * article: Journal article * patent: Patent * preprint: Preprint * deliverable: Project deliverable * milestone: Project milestone * proposal: Proposal * report: Report * softwaredocumentation: Software documentation * taxonomictreatment: Taxonomic treatment * technicalnote: Technical note * thesis: Thesis * workingpaper: Working paper * other: Other
image_type string	Yes, if upload_type is "image".	Controlled vocabulary: * figure: Figure * plot: Plot * drawing: Drawing * diagram: Diagram * photo: Photo

		* other: Other
publication_date string	Yes	Date of publication in ISO8601 format (YYYY-MM-DD). Defaults to current date.
title string	Yes	Title of deposition
creators array of objects	Yes	The creators/authors of the deposition. Each array element is an object with the attributes: * name: Name of creator in the format Family name, Given names * affiliation: Affiliation of creator (optional). * orcid: ORCID identifier of creator (optional). * gnd: GND identifier of creator (optional). Example: [{'name':'Doe, John', 'affiliation': 'Zenodo'}, {'name':'Smith, Jane', 'affiliation': 'Zenodo', 'orcid': '0000-0002-1694-233X'}, {'name': 'Kowalski, Jack', 'affiliation': 'Zenodo', 'gnd': '170118215'}]
creators array of objects	Yes	The creators/authors of the deposition. Each array element is an object with the attributes: * name: Name of creator in the format Family name, Given names * affiliation: Affiliation of creator (optional). * orcid: ORCID identifier of creator (optional). * gnd: GND identifier of creator (optional). Example: [{'name':'Doe, John', 'affiliation': 'Zenodo'}, {'name':'Smith, Jane', 'affiliation': 'Zenodo', 'orcid': '0000-0002-1694-233X'}, {'name': 'Kowalski, Jack', 'affiliation': 'Zenodo', 'gnd': '170118215'}]
description string (allows HTML)	Yes	Abstract or description for deposition.
access_right string	Yes	Controlled vocabulary: * open: Open Access * embargoed: Embargoed Access * restricted: Restricted Access * closed: Closed Access Defaults to open.
license	Yes, if access_right is	Controlled vocabulary:

string	"open" or "embargoed".	The selected license applies to all files in this deposition, but not to the metadata which is licensed under Creative Commons Zero. Further information about licenses is available at Open Definition Licenses Service. Defaults to cc-by for non-datasets and cc-zero for datasets.
embargo_date date	Yes, if access_right is "embargoed".	When the deposited files will be made automatically made publicly available by the system. Defaults to current date.
access_conditions string (allows HTML)	Yes, if access_right is "restricted"	Specify the conditions under which you grant users access to the files in your upload. User requesting access will be asked to justify how they fulfil the conditions. Based on the justification, you decide who to grant/deny access. You are not allowed to charge users for granting access to data hosted on Zenodo.
doi string	No	Digital Object Identifier. Did a publisher already assign a DOI to your deposited files? If not, leave the field empty and we will register a new DOI for you when you publish. A DOI allow others to easily and unambiguously cite your deposition.
prereserve_doi object/bool	No	Set to true, to reserve a Digital Object Identifier (DOI). The DOI is automatically generated by our system and cannot be changed. Also, The DOI is not registered with DataCite until you publish your deposition, and thus cannot be used before then. Reserving a DOI is useful, if you need to include it in the files you upload, or if you need to provide a dataset DOI to your publisher but not yet publish your dataset. The response from the REST API will include the reserved DOI.
keywords array of strings	No	Free form keywords for this deposition. Example: ["Keyword 1", "Keyword 2"]
notes string (allows HTML)	No	Additional notes
related_identifiers array of objects	No	Persistent identifiers of related publications and datasets. Supported identifiers include: DOI, Handle, ARK, PURL, ISSN, ISBN, PubMed ID, PubMed Central ID, ADS Bibliographic Code, arXiv, Life Science Identifiers (LSID), EAN-13, ISTC, URNs and URLs. Each array element is an object with the attributes: * identifier: The persistent identifier * relation: Relationship. Controlled vocabulary

		(isCitedBy, cites, isSupplementTo, isSupplementedBy, isNewVersionOf, isPreviousVersionOf, isPartOf, hasPart, compiles, isCompiledBy, isIdenticalTo, isAlternateIdentifier). Example: [{'relation': 'isSupplementTo', 'identifier':'10.1234/foo'}, {'relation': 'cites', 'identifier':'https://doi.org/10.1234/bar'}] Note the identifier type (e.g. DOI) is automatically detected, and used to validate and normalize the identifier into a standard form.
contributors array of objects	No	The contributors of the deposition (e.g. editors, data curators, etc.). Each array element is an object with the attributes: * name: Name of creator in the format Family name, Given names * type: Contributor type. Controlled vocabulary (ContactPerson, DataCollector, DataCurator, DataManager,Distributor, Editor, Funder, HostingInstitution, Producer, ProjectLeader, ProjectManager, ProjectMember, RegistrationAgency, RegistrationAuthority, RelatedPerson, Researcher, ResearchGroup, RightsHolder,Supervisor, Sponsor, WorkPackageLeader, Other) * affiliation: Affiliation of creator (optional). * orcid: ORCID identifier of creator (optional). * gnd: GND identifier of creator (optional). Example: [{'name':'Doe, John', 'affiliation': 'Zenodo', 'type': 'Editor' }, ...] references array of strings No List of references. Example: ["Doe J (2014). Title. Publisher. DOI", "Smith J (2014). Title. Publisher. DOI"]
references array of strings	No	List of references Example: ["Doe J (2014). Title. Publisher. DOI", "Smith J (2014). Title. Publisher. DOI"]
communities array of objects	No	List of communities you wish the deposition to appear. The owner of the community will be notified, and can either accept or reject your request. Each array element is an object with the attributes:

		* identifier: Community identifier Example: [{'identifier':'ecfunded'}]
grants array of objects	No	List of OpenAIRE-supported grants, which have funded the research for this deposition. Each array element is an object with the attributes: * id: grant ID. Example: [{'id':'283595'}] (European Commission grants only) or funder DOI-prefixed: [{'id': '10.13039/501100000780::283595'}] (All grants, recommended) Accepted funder DOI prefixes: Australian Research Council: 10.13039/501100000923 European Commission: 10.13039/501100000780 Fundação para a Ciência e a Tecnologia: 10.13039/501100001871 Ministarstvo Prosvete, Nauke i Tehnološkog Razvoja: 10.13039/501100004564 Ministarstvo Znanosti, Obrazovanja i Sporta: 10.13039/501100006588 National Health and Medical Research Council: 10.13039/501100000925 National Science Foundation: 10.13039/100000001 Nederlandse Organisatie voor Wetenschappelijk Onderzoek: 10.13039/501100003246 Wellcome Trust: 10.13039/100004440
journal_title string	No	Journal tilte, if deposition is a published article
journal_volume string	No	Journal volume, if deposition is a published article
journal_issue string	No	Journal issue, if deposition is a published article
journal_pages string	No	Journal pages, if deposition is a published article
conference_title string	No	Title of conference (e.g. 20th International Conference on Computing in High Energy and

		Nuclear Physics).
conference_acronym string	No	Acronym of conference (e.g. CHEP'13).
conference_dates string	No	Dates of conference (e.g. 14-18 October 2013). Conference title or acronym must also be specified if this field is specified
conference_place string	No	Place of conference in the format city, country (e.g. Amsterdam, The Netherlands). Conference title or acronym must also be specified if this field is specified.
conference_url string	No	URL of conference (e.g. http://www.chep2013.org/).
conference_session string	No	Number of session within the conference (e.g. VI).
conference_session_part string	No	Number of part within a session (e.g. 1).
imprint_publisher string	No	Publisher of a book/report/chapter
imprint_isbn string	No	ISBN of a book/report
imprint_place string	No	Place of publication of a book/report/chapter in the format city, country.
partof_title string	No	Title of book for chapters
partof_pages	No	Pages numbers of book
thesis_supervisors	No	Supervisors of the thesis. Same format as for creators
thesis_university	No	Awarding university of thesis
subjects array of objects	No	Specify subjects from a taxonomy or controlled vocabulary. Each term must be uniquely identified (e.g. a URL). For free form text, use the keywords field. Each array element is an object with the attributes: * term: Term from taxonomy or controlled vocabulary. * identifier: Unique identifier for term.

		* scheme: Persistent identifier scheme for id (automatically detected). Example: [{"term": "Astronomy", "identifier": "http://id.loc.gov/authorities/subjects/sh85009003", "scheme": "url"}]
version version	No	Version of the resource. Any string will be accepted, however the suggested format is a semantically versioned tag (see more details on semantic versioning at semver.org) Example: 2.1.5
language string	No	Specify the main language of the record as ISO 639-2 or 639-3 code, see Library of Congress ISO 639 codes list. Example: eng
locations array of obje	No	List of locations * lat (double): latitude * lon (double): longitude * place (string): place's name (required) * description (string): place's description (optional) Example: [{"lat": 34.02577, "lon": -118.7804, "place": "Los Angeles"}, {"place": "Mt.Fuji, Japan", "description": "Sample found 100ft from the foot of the mountain."}]
dates array of objects	No	List of date intervals * start (ISO date string): start date (*) * end (ISO date string): end date (*) * type (Collected, Valid, Withdrawn): The interval's type (required) * description (string): The interval's description (optional) (*) Note that you have to specify at least a start or end date. For an exact date, use the same value for both start and end. Example: [{"start": "2018-03-21", "end": "2018-03-25", "type": "Collected", "description": "Specimen A5 collection period."}]
method string (allows HTML)	No	The methodology employed for the study or research

https://developers.zenodo.org/#representation